Colville River Delta Spring Breakup 2013 Field Report

ConocoPhillips Alaska

Submitted by

Baker

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Project Number: 135141

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FIGURES

PHOTOGRAPHS

ACRONYMS AND ABBREVIATIONS

Baker	Michael Baker Jr., Inc.
CPAI	ConocoPhillips Alaska, Inc.
CRD	Colville River Delta
HSE	Health, Safety, and Environment
JSA	Job Safety Analysis
MON	Monument
WSE	Water surface elevation

1.0 INTRODUCTION

Michael Baker Jr., Inc. (Baker) provided hydrology monitoring services to ConocoPhillips Alaska, Inc. (CPAI) for the 2013 Colville River Delta (CRD) Spring Breakup Hydrologic Assessments. The CRD field study is conducted annually to support CPAI permit stipulations by evaluating the effect of breakup flooding events. The field programs and observations acquired through these efforts are integral to understanding the regional hydrology and maintaining the continued safety of the environment, oilfield personnel, and facilities during annual flooding, and are important to obtaining future permits and designing future facilities.

Spring breakup on the North Slope of Alaska is the largest annual flooding event in the region. In 2013, breakup lasted approximately three weeks from the end May to early June. This report provides an initial summary of the 2013 CRD spring breakup field programs and general observations. The comprehensive hydrological assessment reports, including results of the data analysis, will be submitted in November 2013.

1.1 2013 SPRING BREAKUP FIELD STUDY

The primary objective of the 2013 CRD Spring Breakup Hydrologic Assessment is to monitor and estimate the magnitude and extent of breakup flooding within the CRD. Figure 1 shows primary monitoring locations in the CRD, and Figure 2 shows the primary Alpine facilities monitoring locations. Measurements of water surface elevation (WSE) were collected around existing Alpine pads, facilities, and pipelines; at other locations, including the proposed CD5 facilities; and at select lakes used for drinking water, drilling activities, and ice road construction. Discharge was measured at Alpine facility drainage structures and near the Monument 1 (MON1) monitoring site. Observations of ice and ice jam activities, ice road crossing degradation, and post-breakup floodwater effects were collected.

All field tasks were performed in compliance with Baker's North Slope Water Resources 2013 Health Safety and Environment (HSE) Plan and project-specific Job Safety Analysis (JSA). Field personnel participated in a health and safety meeting prior to the start of work each day. Task hazard checklists and Helicopter Toolbox meetings were completed daily by each field crew prior to the initiation of work.

Photo 1: CD2 Pad; June 4, 2013

N
W
E
S

Harrison Bay

MON28

CD 3 Pad

Ulamnigiaq Channel

M0675

Tamayayak Channel

Sakoonang Channel

L9301

B8533

MON23

Alpine CD 1 Pad

M9933

B8534/L9282

L9321

CD 2 Pad

L9322

L9313

M9524

L9312

M9525

MON22

Nanuq Lake

Proposed CD 5 Pad

L9341

L9323

Tapped Lake

CD 4 Pad

L9324

MON20

Niglagvik Channel

Sakoonang Channel

East Channel

Niglig Channel

B8531/L9326

MON9D-PT

MON9

M9607

B8530

HDD East

HDD West

Nuiqsut

Putu Channel

M9602

M9605

Alpine Sales Pipeline

Helmericks Homestead

MON35

Miluveach River

Kachemach River

MON1D

MON1C

MON1U

Colville River

Itkillik River

Legend

- Monument Locations
- Pipelines
- Existing Roads
- Proposed Roads
- Lake
- Monitoring Lake
- Existing Facilities
- Proposed Facilities

ConocoPhillips Alaska

Miles
0 1 2

Date:	05/05/2013	Project:	135141
Drawn:	BTG	File:	Figure 1
Checked:	SME	Scale:	1 in = 2 miles

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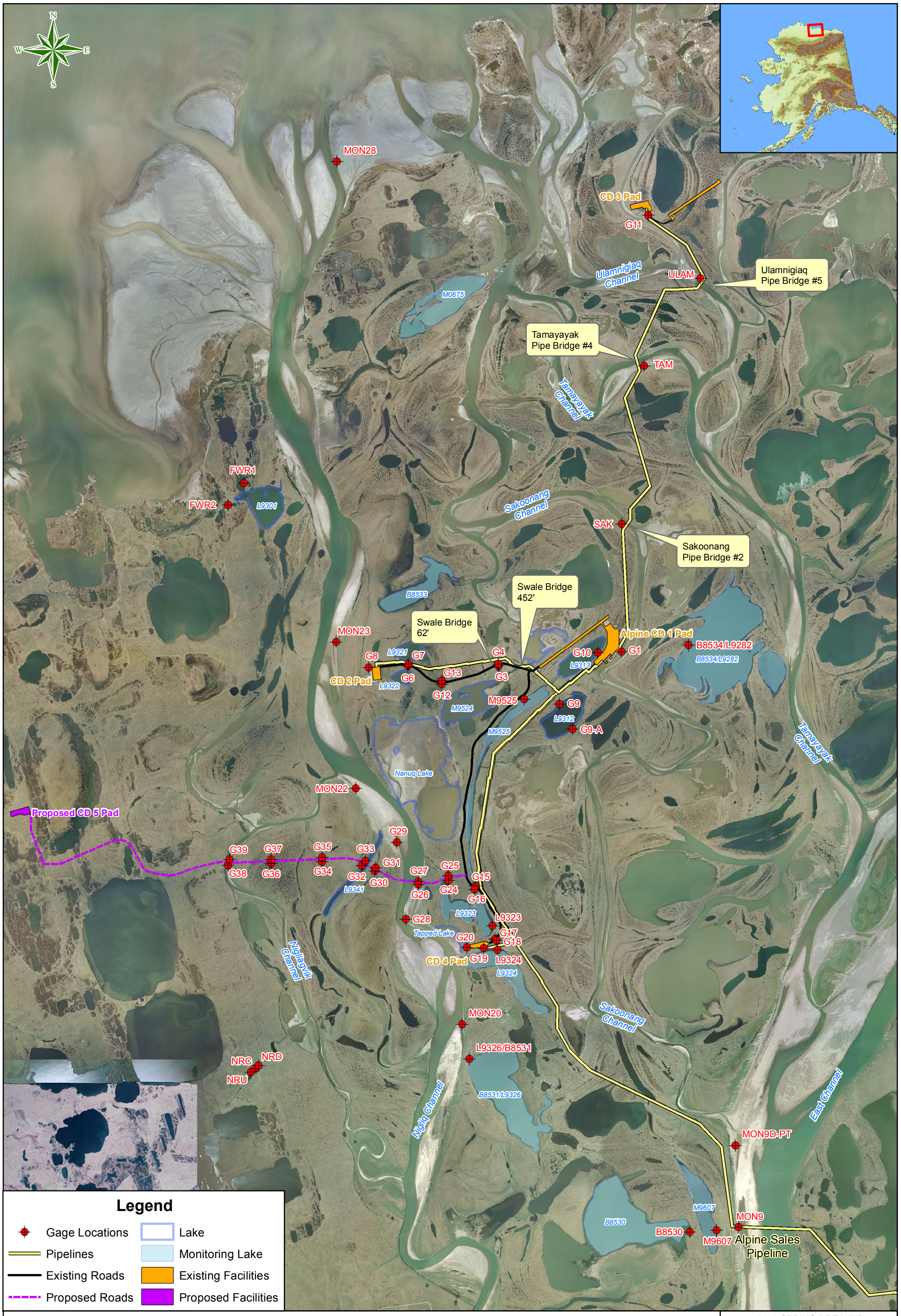
2013 SPRING BREAKUP

COLVILLE RIVER DELTA

MONITORING LOCATIONS

FIGURE: 1

(SHEET 1 of 1)



ConocoPhillips Alaska

Miles
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Date:	05/05/2013	Project:	135141
Drawn:	BTG	File:	Figure 2
Checked:	SME	Scale:	1 in = 1 miles

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2013 SPRING BREAKUP

ALPINE AREA FACILITIES

MONITORING LOCATIONS

FIGURE: 2

(SHEET 1 of 1)

1.2 METHODS SUMMARY

Sets of either existing or newly installed staff gages were used to measure WSEs. Existing staff gages were rehabilitated as needed. All gages were surveyed prior to spring breakup and assigned elevations tied to British Petroleum Mean Sea Level (Photo 3).

Photo 2: Conducting surveys during spring breakup setup; May 8, 2013

At select gage locations, pressure transducer data loggers were installed to digitally record changes in pressure induced by the height of the water column above the instrument (Photo 4). The data collected from the pressure transducers supplement gage readings to provide a continuous record of local WSE. Railroad chalk was applied to all gages and used to manually record high water levels.

Photo 3: Pressure Transducer at Gage G29-A; May 10, 2013

Discharge data was collected by applying U.S. Geologic Survey approved techniques. A daily observation of breakup progression was recorded. The observations included the arrival and progression of the leading edge of initial breakup flood flow, ice jam activities, lake recharge and drainage, condition of channel ice, flooding extents, peak stage, degradation of ice road crossings, recession of water, location and quantities of grounded ice floes, and the general effects of flooding and ice at monitoring sites. Alpine facilities access roads and pads were preliminarily evaluated for potential erosion affects due to floodwaters after the recession of the flood stage.

Field teams submitted Daily Field Reports summarizing work accomplished and general observations of conditions during both the setup and monitoring phases. These reports document relevant project information and compliance with Baker's HSE Plan and spring breakup monitoring project specific JSAs, identify field staff, and outline work planned for the next field day. Photo documentation of areas and events of interest are also included. Daily Field Reports for setup and monitoring are included in Appendix A and Appendix B, respectively.

1.3 Dates of Work

The field effort for the CRD Spring Breakup Hydrologic Assessment occurred between May 4 and June 10, 2013. Field crews began setup and rehabilitation of monitoring gages between May 6 and May 14, 2013. Breakup monitoring began on May 27 and ended on June 10, 2013.

2.0 General Observations of 2013 Spring Breakup Conditions

Unseasonably cold spring temperatures in the northern Brooks Range and foothills delayed the onset of spring breakup flooding in the CRD. Overnight freezing temperatures at Alpine and Umiat endured into early June inhibiting local snow melt and prolonging the progression of melt water in the drainage basin. High temperatures, over 60°F observed at Umiat on June 2, accelerated melting of the snowpack and intensified flow in the Colville River and its tributaries. A narrative of the 2013 CRD spring breakup observations are presented below.

Field personnel performed a reconnaissance flight upstream of MON1 on the Colville River on May 27. The leading edge of the melt water in the Colville River was identified approximately 1 mile downstream of Ocean Point. Flow was predominantly below the ice, with intermittent pockets of visible open water flow (Photo 5). The leading edge of the open water was in the vicinity of Alpine facilities on May 30 in both the Nigliq and East channels; no overbank flow was observed in the vicinity of the facilities. By May 31, all major channels in the CRD were conveying floodwater and Nanuq Lake was recharging from overbank flow in the Nigliq Channel. On June 1, both swale bridges and adjacent culverts along the CD2 road were observed passing flow (Photo 6). Overbank flow was also observed in the vicinity of the CD4 road and pad as Lake L9324 recharged from the Sakoonang and Nigliq channels.

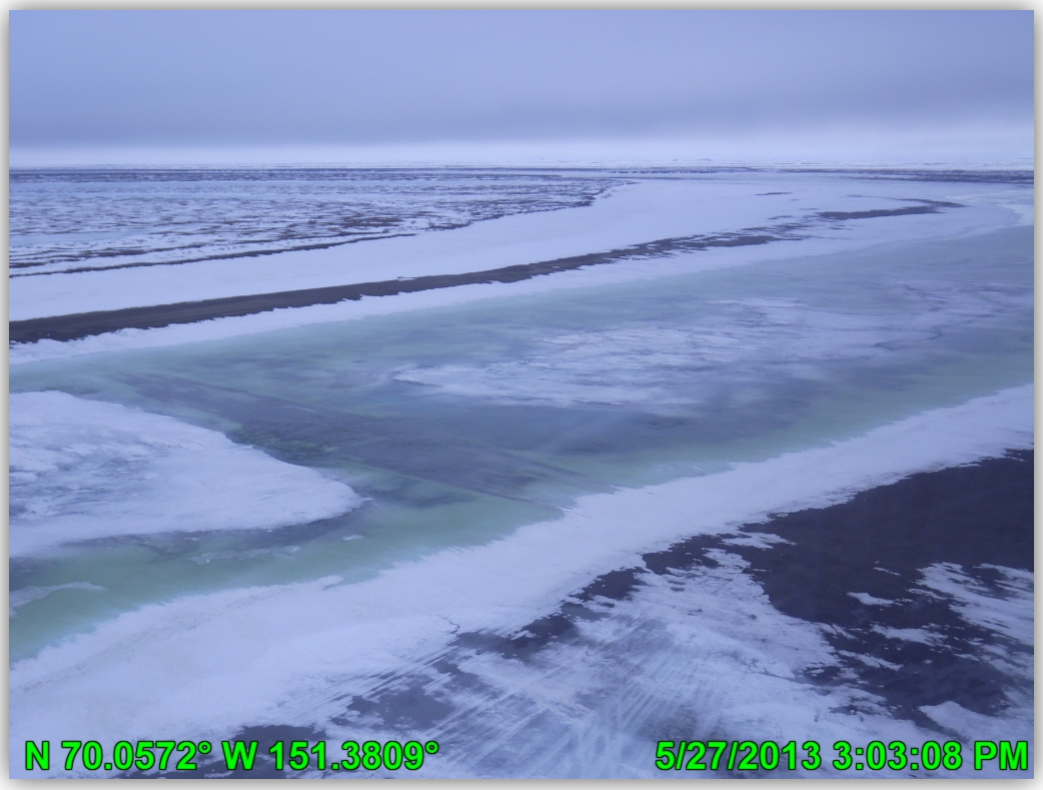

Photo 4: Melt water emerging from below the ice cover and flowing over remnants of an ice bridge near Ocean Point; May 27, 2013

Photo 5: Small Swale bridge conveying flow thru snow blockage; June 1, 2013

On June 2, an ice jam was observed approximately 7 miles upstream of MON1. The ice jam was estimated to have released around June 3 and reformed one mile south of CD4 in the Nigliq Channel and in the East Channel near the Tamayayak bifurcation. Peak stage at MON1 is expected to have occurred on June 3, which is later than the historical average. By June 4, water levels had increased significantly in the delta and around facilities. Diverted flood water around the Nigliq Channel ice jam inundated the floodplain south of the CD2 road at which point all CD2 culverts were conveying flow (Photo 7 and Photo 8). Backwater from the East Channel ice jam flooded the Sakoonang Channel and contributed to flood water south of the CD4 pad, initiating flow through the CD4 culvert batteries into Lake M9525. The swale bridges and all culverts appeared to function properly through the duration of the flood. Alpine drinking water lakes L9313 and L9312 were observed recharging from Lake M9252 and the Sakoonang Channel respectively.

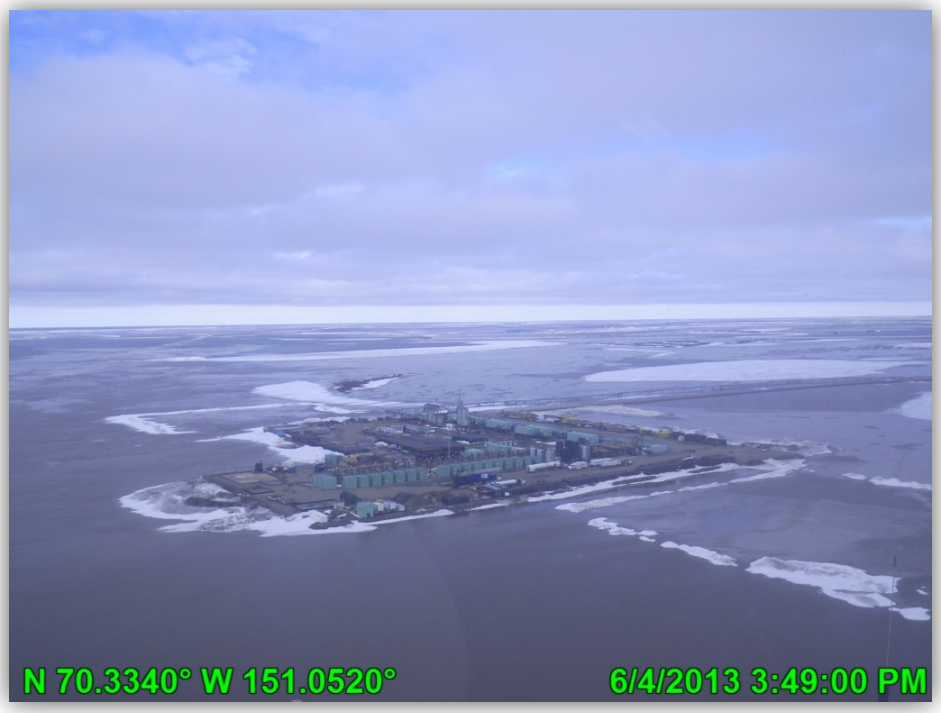

Photo 6: CD2 surrounded by overbank flow from the Nigliq Channel ice jam; June 4, 2013

Photo 7: Nigliq channel ice jam upstream of CD4; June 4, 2013

By the afternoon of June 4, flood water had peaked near the CD2 facilities (Photo 9). By June 5, flood water had peaked near the CD4 facilities. Water levels began to quickly recede around facilities once the ice jam in the Nigliq Channel released and moved downstream. By June 8th, water level gages around facilities were dry.

Photo 8: CD2 culvert batteries submerged due to peak flood waters; June 4, 2013

Appendix A Setup – Daily Field Reports

Daily Field Report

Project Name	Alpine Area Lakes Recharge Study			**Date**	May 4, 2013
Project Number	135205	**Document No.**	n/a		
Submitted by	Garrett Yager				
Field Personnel	Garrett Yager, Steven Clark and Bill Brooks				
Subcontractor	UMIAQ (LCMF)				
Morning Check-In	9:00 AM	**Contact Person**	Alpine Security		
Evening Check-In	6:oo PM	**Contact Person**	Alpine Security		

Wind	**Temperature**	**Sky**
2 mph	6°F	Partly Cloudy

Health & Safety
Attended UMIAQ morning safety meeting. Reviewed Hägglund and snow machine safety prior to departure.
Summary of Events
Departed Alpine by Hägglund with AJ Griffin (UMIAQ). A late season snow survey was performed on Lake M9605. Berms associated with snow clearing for ice and water withdrawal were profiled.
Challenges
None
Comments
None
Planned for Next Field Day
Perform late season snow survey at Lake M9602.

Daily Photo (s)

Photo 1: Performing snow density measurements at Lake M9605

Photo 2: Getting ready to perform snow depth measurements at Lake M9605

Photo 3: Profiling berm on Lake M9605

Photo 4: Taking snow cores at Lake M9605

Daily Field Report

Project Name	Alpine Area Lakes Recharge Study			**Date**	May 5, 2013
Project Number	135205	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Steven Clark, Bill Brooks, and Garrett Yager				
Subcontractor	LCMF				
Morning Check-In	9:00 AM	**Contact Person**	Alpine Security		
Evening Check-In	7:00 PM	**Contact Person**	Alpine Security		

Wind	**Temperature**	**Sky**
10 mph SE	12° F	Clear

Health & Safety
Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund and snow machine safety prior to departure.
Summary of Events
A late season snow survey was performed on Lake M9602. Berms associated with snow clearing for ice and water withdrawal were profiled.
Challenges
None
Comments
None
Planned for Next Field Day
Begin setting up office and organizing supplies in preparation for Colville River Delta spring breakup activities.

Daily Photo (s)

Photo 1: Preparing equipment for snow depth and density measurements at Lake M9602.

Photo 2: Weighing collected snow and recording notes at Lake M9602.

Daily Field Report

Project Name(s)	Alpine Lakes Drinking Water Quality and CRD Spring Breakup Monitoring		**Date**	May 6, 2013
Project Number	132995/135141	**Document No.**	N/A	
Submitted by	Steven Clark			
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, and Kris Homerding			
Subcontractor	LCMF			
Morning Check-In	9:00 AM	**Contact Person**	Karen Brown	
Evening Check-In	8:00 PM	**Contact Person**	Karen Brown	

Wind	**Temperature**	**Sky**
10 mph SE	25° F	Clear

Health & Safety

Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.

Summary of Events

Lake water quality monitoring and water surface elevation measurements were completed on lakes L9312 and L9313. The Environmental office was setup and organized for spring breakup activities. Two additional crew members arrived at Alpine for spring breakup monitoring activities.

Challenges

Received equipment pallet at Alpine and noted several missing items. Pallet appeared to be repackaged. Items essential to performing spring breakup setup that are missing include the angle iron, Emergency Locator Beacon, and tripod. Other smaller items missing include (but are not limited to) duct tape, electrical tape, leather gloves, orange waterproof gloves, and pencils.

Comments

None

Planned for Next Field Day

Crews will begin preparing monitoring sites around the Colville River Delta for spring breakup monitoring.

Daily Photo (s)

Photo 1: Drilling a hole through the lake ice for water quality measurements on Lake L9312; May 6, 2013

Photo 2: Water quality measurements on Lake L9313; May 6, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup Monitoring	**Date**	May 7, 2013
Project Number	135141	**Document No.**	N/A
Submitted by	Steven Clark		
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, and Kris Homerding		
Subcontractor	LCMF		
Morning Check-In	7:45 AM	**Contact Person**	Karen Brown
Evening Check-In	6:30 PM	**Contact Person**	Karen Brown

Wind	**Temperature**	**Sky**
10 mph S	28° F	Partly Cloudy

Health & Safety
Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.
Summary of Events
Crews dug out gages at three monitoring sites at the head of the delta, performed any necessary repairs, and installed pressure transducers. Two of the three monitoring sites were tied to the established elevation datum.
Challenges
Carlile has located some of the missing freight that is essential to performing spring breakup setup. They will ship these items to Alpine with an estimated time of arrival of May 8 and continue to search for the remaining pieces. Once crews receive the shipment, they will inventory equipment and determine what needs to be ordered and reshipped from Anchorage.
Comments
None
Planned for Next Field Day
Crews will finish tying in the remaining monitoring site at the head of the delta to the established elevation datum and begin rehabilitating gages at the HDD crossing.

Daily Photo (s)

Photo 1: Setting up survey equipment; May 7, 2013

Photo 2: Surveying gages at Monument 1 Downstream; May 7, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup Monitoring			**Date**	May 8, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, and Kris Homerding				
Subcontractor	LCMF				
Morning Check-In	8:15 AM	**Contact Person**	Alpine Security		
Evening Check-In	5:30 PM	**Contact Person**	Alpine Security		
Wind		**Temperature**		**Sky**	
15 mph S		28° F		Snow	

Health & Safety

Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.

Summary of Events

Crews finished surveying Monument 1 gages at the head of the delta, dug out, surveyed, and rehabilitated Monument 9 gages at HDD and along the Nigliq Channel just south of CD4.

Challenges

Crews have not received shipment of missing freight from Carlile. Once crews receive the shipment, they will inventory equipment and determine what needs to be ordered and reshipped from Anchorage.

Comments

None

Planned for Next Field Day

Crews will install and survey in a pressure transducer at the downstream location of Monument 9, and prepare gages for Lake M9602, Lake M9605, and Monument 35 (Helmericks).

Daily Photo (s)

Photo 1: Gage dug out and rehabilitated at Mon 9 (HDD); May 8, 2013

Photo 2: Surveying gages at Mon 9 (HDD); May 8, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup/CD5			**Date**	May 9, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, and Kris Homerding				
Subcontractor	LCMF				
Morning Check-In	9:00 AM	**Contact Person**	Alpine Security		
Evening Check-In	6:00 PM	**Contact Person**	Alpine Security		

Wind	**Temperature**	**Sky**
7 mph	28° F	Cloudy/Clear

Health & Safety

Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.

Summary of Events

Crews surveyed and rehabilitated gages at MON 35 (Helmericks) and installed pressure transducers at MON 9D (downstream of HDD crossing) and MON 20 (south of CD4). G28 (on the east bank upstream of the CD5 Nigliq channel bridge crossing) was rehabilitated and surveyed.

Challenges

The pallet of supplies arrived on May 6, 2013 with items missing. Some of the missing items were located in Deadhorse and are in-route to Alpine. Field personnel continue to investigate the missing items.

Comments

None

Planned for Next Field Day

Crews will work on gages at MON28, CD3 pipeline bridges, MON 22, and MON 23, and begin working on monitoring sites along the proposed CD5 road within the Colville Delta.

Daily Photo (s)

Photo 1: Monument 35; May 9, 2013

Photo 2: Installing a pressure transducer at MON 9D; May 9, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup/CD5			**Date**	May 10, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, Kris Homerding, and Sarah Case				
Subcontractor	LCMF				
Morning Check-In	9:00 AM	**Contact Person**	Alpine Security		
Evening Check-In	6:00 PM	**Contact Person**	Alpine Security		

Wind	**Temperature**	**Sky**
11 mph	32° F	Cloudy/Clear

Health & Safety

Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.

Summary of Events

Crews completed setup activities at Monuments 22, 23, and 28, Gages 32, 33, 34, 35, 36, 37, 38, and 39 along the proposed CD5 road, and Gages 8, 3, 4, 12, and 13 along the CD2 road. Sarah Case arrived today to round out setup personnel.

Challenges

Items from the pallet are still missing.

Comments

None

Planned for Next Field Day

Crews will continue working on CD5 alignment gages, as well as the CD3 pipeline crossings.

Daily Photo (s)

Photo 1: Monument 23; May 10, 2013

Photo 2: Digging out Gage 4 along the CD2 road; May 10, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup/CD5			**Date**	May 11, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, Kris Homerding, and Sarah Case				
Subcontractor	LCMF				
Morning Check-In	9:00 AM	**Contact Person**	Alpine Security		
Evening Check-In	6:00 PM	**Contact Person**	Alpine Security		

Wind	**Temperature**	**Sky**
10 mph	30° F	Snow

Health & Safety
Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.
Summary of Events
Crews completed setup of gages G9 and G10 on lakes L9312 and L9313; G11 at CD3; Sakoonang, Tamayayak, and Ulamnigiaq pipeline crossings; G26, G27, G29, G30, and G31 along the proposed CD5 alignment.
Challenges
Angle iron is still missing from the shipment.
Comments
A box of missing items from the shipment was recovered today.
Planned for Next Field Day
Crews will perform a late season snow survey on Lake M9603, setup gages on Lake L9341, and begin setup on ice road supply lakes.

Daily Photo (s)

Photo 1: SAK gage array near the Sakoonang pipeline bridge; May 11, 2013

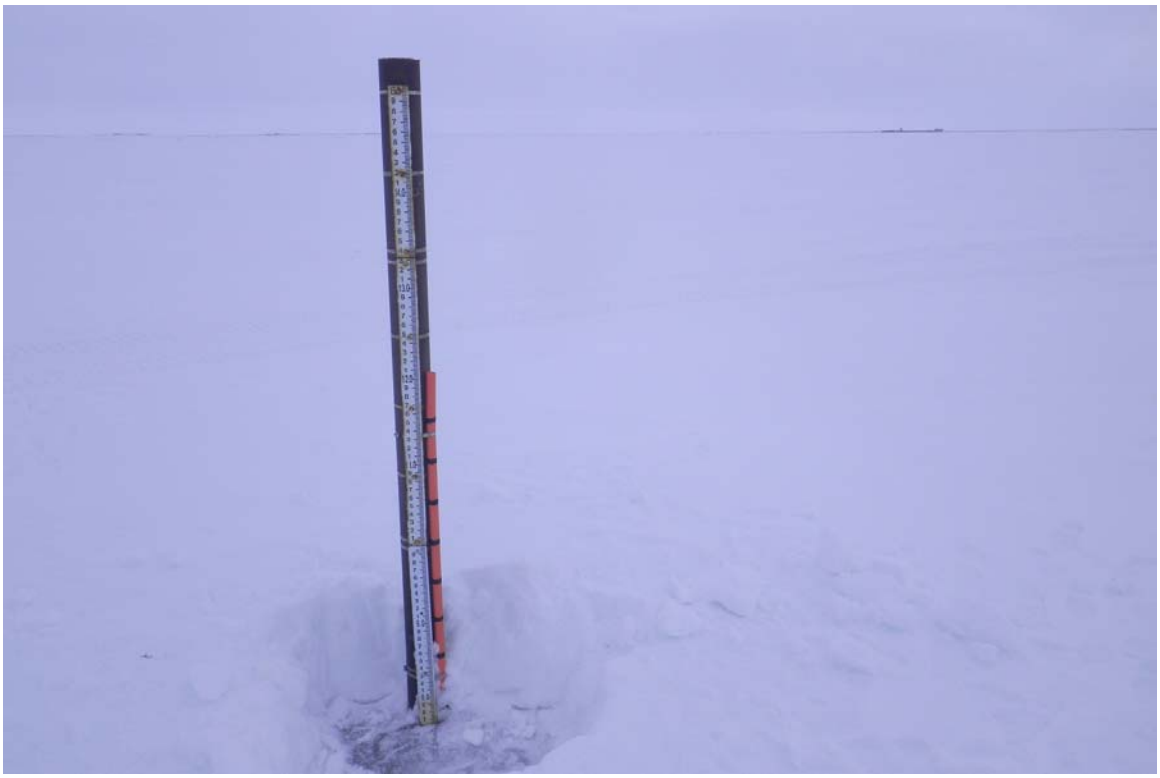

Photo 2: Gage 9 on Lake L9312; May 11, 2013

Daily Field Report

Project Name(s)	Colville River Delta Spring Breakup and Alpine Area Lakes Recharge Study		**Date**	May 12, 2013
Project Number	135141/135205	**Document No.**	N/A	
Submitted by	Steven Clark			
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, Kris Homerding, and Sarah Case			
Subcontractor	LCMF			
Morning Check-In	9:00 AM	**Contact Person**	Alpine Security	
Evening Check-In	4:00 PM	**Contact Person**	Alpine Security	

Wind	**Temperature**	**Sky**
10 mph	30° F	Snow

Health & Safety
Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.
Summary of Events
Crews completed setup of gages and installed pressure transducers at G1, G24, and G25. Crews also completed setup at lakes B8534/L9282, L9324, M9602, M9605, B8530.
Challenges
Angle iron is still missing from the shipment.
Comments
None
Planned for Next Field Day
Crews will setup gages on remaining lakes and along the CD4 road.

Daily Photo (s)

Photo 1: Gage G1 on the Sakoonang Channel near CD1; May 12, 2013

Daily Field Report

Project Name(s)	Colville River Delta Spring Breakup and Alpine Area Lakes Recharge Study	**Date**	May 13, 2013
Project Number(s)	135141/135205	**Document No.**	N/A
Submitted by	Garrett Yager		
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, Kris Homerding, and Sarah Case		
Subcontractor	LCMF		
Morning Check-In	10:00 AM	**Contact Person**	Alpine Security
Evening Check-In	5:00 PM	**Contact Person**	Alpine Security

Wind	**Temperature**	**Sky**
10 mph	16° F	Snow and overcast

Health & Safety

Field personnel attended LCMF's daily safety meeting. The safety meeting included a Personal Floatation Device and boating safety session. Crews were also briefed on Hägglund safety prior to departure.

Summary of Events

Crews completed setup of gages at G17, G18, G19 and G20. Pressure transducers were installed at G3 and G4 and a barometric pressure logger was installed at G19.

Crews also completed setup at lakes B8530, L9326/B8531, L9323 and M9525.

Challenges

Angle iron is still missing from the shipment.

Comments

A storm is scheduled to move in tonight extending into late Tuesday.

Planned for Next Field Day

Crews will perform a late season snow survey and install gages at M9603. Crews will also setup gages at G15 and G16.

Daily Photo(s)

Photo 1: Rehabilitating and preparing to survey gages at G17 along the CD4 road; May 13, 2013

Photo 2: Evidence of snow removal at CD4 culverts; May 13, 2013

Daily Field Report

Project Name	Alpine Area Lakes Recharge Study			**Date**	May 14, 2013
Project Number	135205	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Bill Brooks, Steven Clark, Garrett Yager, Brian Gutzwiller, Kris Homerding, and Sarah Case				
Subcontractor	LCMF				
Morning Check-In	9:30 AM	**Contact Person**	Alpine Security		
Evening Check-In	7:00 PM	**Contact Person**	Alpine Security		
Wind		**Temperature**		**Sky**	
20 mph		10° F		Snow and overcast	
Health & Safety					
Field personnel attended LCMF's daily safety meeting. Crews were also briefed on Hägglund safety prior to departure.					
Summary of Events					
Crews completed gage setup and a late season snow survey at lake M9603.					
Challenges					
Phase 2 conditions endured into early afternoon. Angle iron is still missing from the shipment.					
Comments					
None					
Planned for Next Field Day					
Crews will complete setup at gages along the CD4 road (G15, and G16), and catch up on administrative tasks around pad. Field personnel will begin departing Alpine and will return prior to the onset of breakup for monitoring activities.					

Daily Photo(s)

Photo 1: Collecting snow density measurements at lake M9603; May 14, 2013

Photo 2: Back of gage at lake M9603 showing safety stripes used during installation; May 14, 2013

Appendix B Monitoring – Daily Field Reports

Daily Field Report

Project Name	Colville River Delta Spring Breakup			**Date**	May 27, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Steven Clark, Mark McBroom, and Garrett Yager				
Subcontractor	Bristow				
Morning Check-In	2:00 PM	**Contact Person**	Alpine Security		
Evening Check-In	3:30 AM	**Contact Person**	Alpine Security		

Wind	**Temperature**	**Sky**
5 mph	32° F	Cloudy/fog

Health & Safety

Crews held a safety meeting and attended an aircraft safety briefing held by pilot Josh Toal of Bristow prior to departing for field activities.

Summary of Events

Field personnel arrived at Alpine and took a reconnaissance flight south up the Colville River. The leading edge of breakup flow was observed near Ocean Point. Observed flow was limited to pockets of open water where sub ice flow emerged as surface flow.

Setup was completed at Gages 6 and 7 which were previously covered in snow and ice.

Challenges

Angle iron is still missing from the pallet shipment.

Comments

Culvert covers have been removed along the CD2 road.

Planned for Next Field Day

Field personnel will take a flight upstream to gauge how quickly the leading edge is progressing. Afterwards, field personnel will begin setting up monitoring sites in NPRA starting with Ublutuoch river miles 6.7, 6.8, and 6.9.

Daily Photo(s)

Photo 1: Leading edge near Ocean Point; May 27, 2013

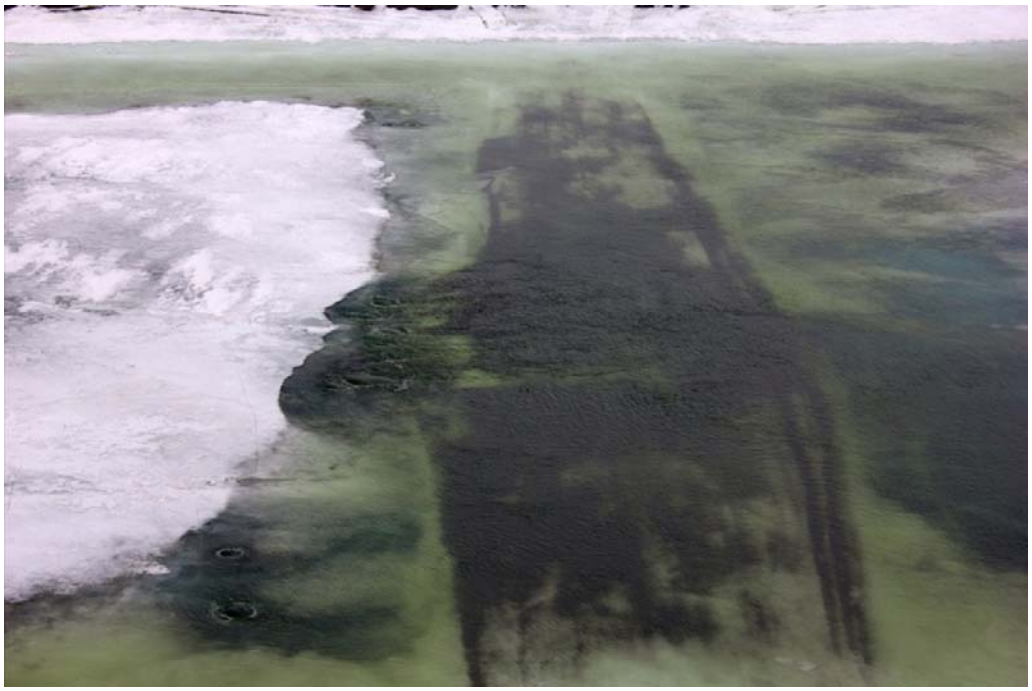

Photo 2: Melt water emerging from below the ice cover and flowing over remnets of an ice bridge near Ocean Point; May 27, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup			**Date**	May 28, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Steven Clark				
Field Personnel	Steven Clark, Mark McBroom, Garrett Yager, and Aaron Wells (ABR)				
Subcontractor	N/A				
Morning Check-In	9:00 AM	**Contact Person**	Alpine Security		
Evening Check-In	12:45 PM	**Contact Person**	Alpine Security		

Wind	**Temperature**	**Sky**
10 mph	38° F	Cloudy

Health & Safety

Field personnel conducted a morning safety meeting. A toolbox meeting was held prior to starting new tasks.

Summary of Events

No helicopter flights took place today due to inclement weather.

Crews carried elevation to Gage 20 and Mon 20 gages from control at CD4 pad.

Field crews rehabilitated, surveyed, and, photographed gages 15-A and 16-A which were under snow from culvert clearing activities.

Challenges

The missing angle iron has been accounted for.

Comments

Based on Umiat webcam observations, intact ice broke apart at approximately 9:30 AM. River stage continues to increase at the USGS Umiat gage.

Culvert covers remain in place on most of the culverts along CD4 road, with the exception of the north and south CD4 culvert batteries, where the covers have been removed. Jodi Smith was notified of covers remaining in place upon the crews return to CD1.

Covers have been removed from the CD2 road culverts.

Planned for Next Field Day

Field personnel will take a flight upstream to gauge how quickly the leading edge is progressing. Depending on the observed progression of the leading edge, field personnel will either dig out and chalk gages in the delta or begin setting up monitoring sites in NPRA starting with the Ublutuoch gages at river miles 6.7, 6.8, and 6.9.

Daily Photo

Photo 1: Newly installed Gage 16-A located next to the old gage which was damaged by culvert snow clearing activities; May 28, 2013

Daily Field Report

Project Name	Colville River Delta/CD5 Spring Breakup	**Date**	May 29, 2013
Project Number	135141	**Document No.**	N/A
Submitted by	Steven Clark		
Field Personnel	Steven Clark, Mark McBroom, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)		
Subcontractor	Bristow		
Morning Check-In	10:00 AM	**Contact Person**	Alpine Security
Evening Check-In	6:00 PM	**Contact Person**	Alpine Security

Wind	**Temperature**	**Sky**
10 mph	34° F	Variable

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure.

Summary of Events

After morning weather delays, personnel began digging gages out from accumulated snow and applying chalk to dry gages to capture high water marks once melt begins. Gages at MON1 (Up, Center, Down), MON9, MON20, MON22, MON23, G38, and G39 were dug out. Gages at MON20 and MON23 were chalked.

Challenges

None.

Comments

3 additional crew members arrived from Anchorage.

The leading edge was approximately 13 miles upstream of MON1 at 10:45 AM, 5-29-13.

Planned for Next Field Day

Field personnel will continue clearing and chalking gages in the delta, at the CD3 pipeline crossing, and at CD5. The second team will begin setup in the Fish Creek Basin at the Ublutuoch gages.

Daily Photo

Photo 1: Unloading the helicopter at MON1U; May 29, 2013

Daily Field Report

Project Name	Colville River Delta/Fish Creek Basin Spring Breakup		**Date**	May 30, 2013
Project Number	135141/135006	**Document No.**	N/A	
Submitted by	Steven Clark			
Field Personnel	Steven Clark, Mark McBroom, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)			
Subcontractor	Bristow			
Morning Check-In	2:00 PM	**Contact Person**	Alpine Security	
Evening Check-In	7:30 PM	**Contact Person**	Alpine Security	

Wind	**Temperature**	**Sky**
5 mph	36° F	Variable

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure.

Summary of Events

Logistical delays prevented departure in the morning. One team rehabilitated gages at the Ublutuoch at river miles 6.7, 6.8, and 6.9 while the second team continued working in the delta digging out and chalking gages.

Leading edge on the East Channel has progressed to the Beaufort Sea.
At 7:20 PM leading edge on the Nigliq Channel was just north of CD2.

Challenges

None.

Comments

Channel ice remains intact in the East Channel and Nigliq Channel. Stage at Umiat has currently leveled-off.

Planned for Next Field Day

Personnel will continue to setup sites in Fish Creek Basin, a second team will perform a reconnaissance flight around the delta gathering gage measurements where possible, and rendezvous with the other crew at UB11.6 to continue setup.

Daily Photo(s)

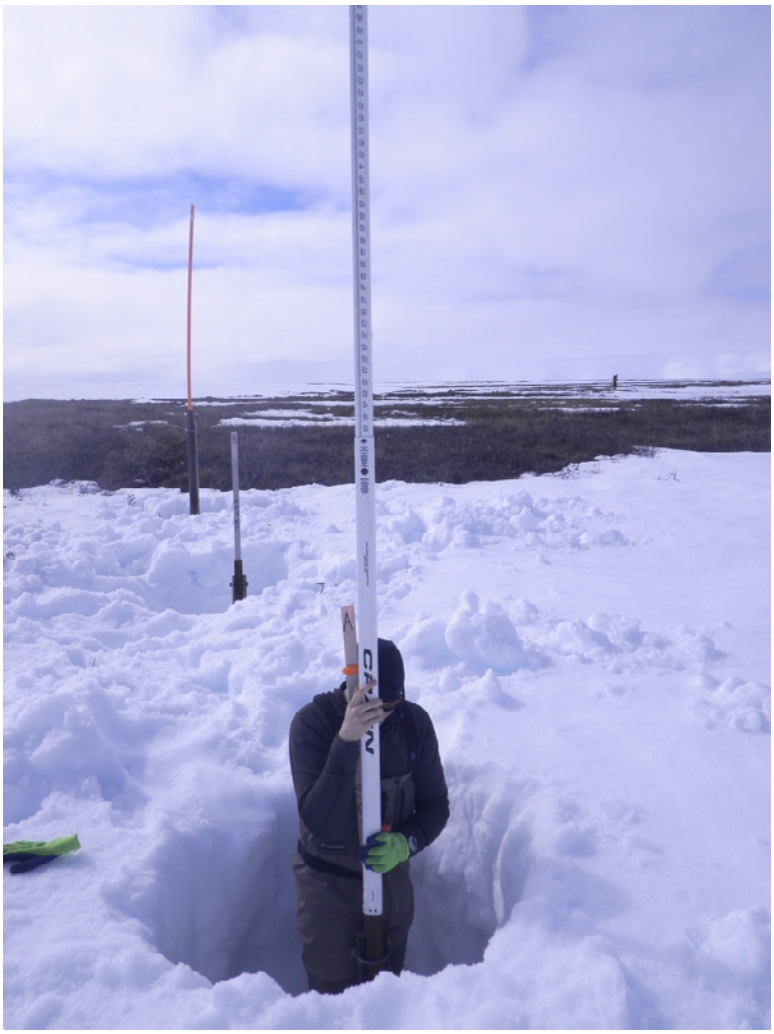

Photo 1: Carrying elevation to UB6.9-A; May 30, 2013

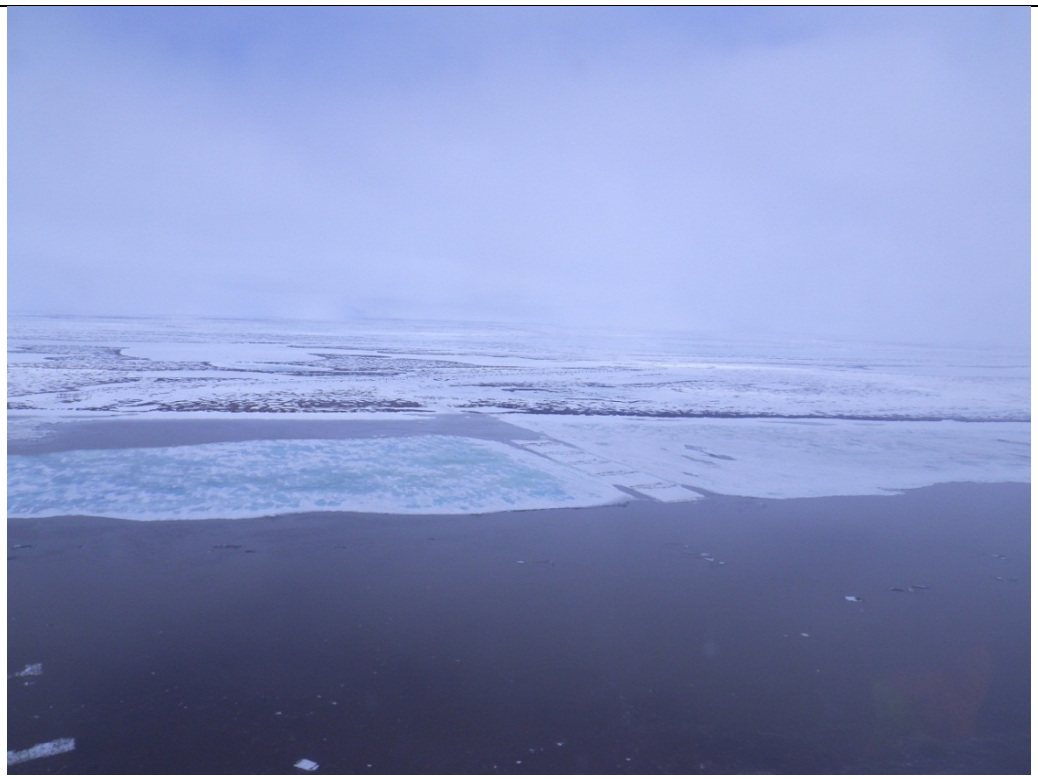

Photo 2: Water flowing around the slotted Colville River ice bridge; May 30, 2013

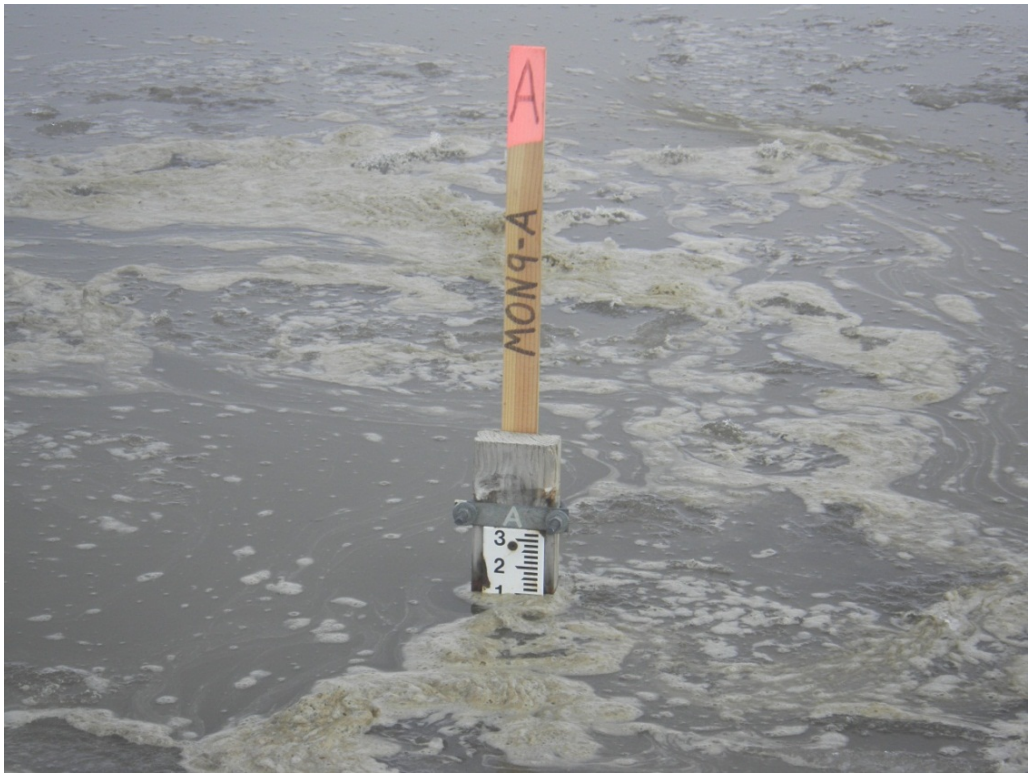

Photo 3: Water has arrived on gages at MON9 near HDD; May 30, 2013

Daily Field Report

Project Name	Colville River Delta/Fish Creek Basin Spring Breakup	**Date**	May 31, 2013
Project Number	135141/135006	**Document No.**	N/A
Submitted by	Steven Clark		
Field Personnel	Steven Clark, Mark McBroom, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)		
Subcontractor	Bristow		
Morning Check-In	2:00 PM	**Contact Person**	Alpine Security
Evening Check-In	7:30 PM	**Contact Person**	Alpine Security

Wind	**Temperature**	**Sky**
5 mph	41°F	Cloudy

Health & Safety

Field personnel held a daily safety meeting, and attended a helicopter toolbox meeting prior to departure.

Summary of Events

Alpine facility gages were dug out and chalked along the CD4 road.
Gages were rehabilitated on the Ublutuoch River at river miles 11.45 and 11.6.
Continued chalking gages and monitoring hydraulic conditions throughout sites in the delta.

Preliminary MON1-C water surface elevation = 13.16 ft. BPMSL (5-31-2013 1:52 PM)

Challenges

None

Comments

The Nigliq Channel and the East Channel are conveying flow to the Beaufort Sea. The Tamayayak and Ulamnigiaq channels are conveying flow along their reach, while the Sakoonang and Nigliagvik channels are flooding from both ends. Channels remain largely clear of ice floes; channel ice remains competent in all reaches.

Lake L9324 is hydraulically connected to the Sakoonang Channel.
Nanuq Lake is receiving overbank flow from the Nigliq Channel.

Planned for Next Field Day

Facility and delta wide gage observations.
Continue set up in Fish Creek Basin.

Daily Photo(s)

Photo 1: HDD east bank; May 31, 2013

Photo 2: Kachemach River pipeline crossing; May 30, 2013

Photo 3: Tamayayak ice bridge looking north; May 31, 2013

Daily Field Report

Project Name	Colville River Delta/Fish Creek Basin Spring Breakup	**Date**	June 1, 2013
Project Number	135141/135006	**Document No.**	N/A
Submitted by	Garrett Yager		
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)		
Subcontractor	Bristow		
Morning Check-In	10:00 AM	**Contact Person**	Alpine Security
Evening Check-In	6:30 PM	**Contact Person**	Alpine Security

Wind	**Temperature**	**Sky**
5-10 mph	45°F	Partly Cloudy

Health & Safety

Field personnel held a daily safety meeting, and attended a helicopter toolbox meeting prior to departure.

Summary of Events

Alpine facility gages were monitored along the CD2 and CD4 roads and pads.
Gages were rehabilitated at the Clover Material Source in Fish Creek Basin.
Monitored hydraulic conditions and stage in the delta.

Preliminary MON1-C water surface elevation = 14.96 ft. BPMSL (6-1-2013 1:06 PM)

Challenges

None.

Comments

Channels remain largely clear of ice floes; intact channel ice remains competent in the Nigliq Channel and East Channel.

Both the Large and Small Swale bridges along the CD2 road were unobstructed and conveying flow. Culverts adjacent to the Swale bridges were conveying flow.

Lake L9324 is hydraulically connected to the Sakoonang and the Nigliq channels. The Sakoonang Channel is now conveying flow.

Early signs of a developing ice jam were observed approximately 7 river miles upstream of MON1.

Planned for Next Field Day

Facility and delta wide gage observations.
Discharge measurements at the Swale bridges.

Daily Photo(s)

Photo 1: Intact channel ice in the Colville River upstream of MON1, looking north ; June 1, 2013

Photo 2: Nigiq Channel and Sakoonang Channel looking north towards Alpine facilities; June 1, 2013

Photo 3: Installing a pressure transducer at Clover Material Source C1; June 1, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup	**Date**	June 2, 2013
Project Number	135141	**Document No.**	N/A
Submitted by	Garrett Yager		
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)		
Subcontractor	Bristow		
Morning Check-In	10:00 AM	**Contact Person**	Alpine Security
Evening Check-In	6:30 PM	**Contact Person**	Alpine Security

Wind	**Temperature**	**Sky**
10 mph	52°F	Clear

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure.

Summary of Events

Alpine facility gages were monitored along the CD2 and CD4 roads and pads.
Monitored hydraulic conditions and stage throughout the delta.

A preliminary high water mark of 16.17 ft. BPMSL was observed at MON1-C, occurring sometime between 6/1 and 6/2.
Preliminary MON1-C water surface elevation = 15.61 ft. BPMSL (6/2/2013 10:40 PM)

Discharge measurements were conducted at the Large and Small Swale bridges.

Gages were rehabilitated and pressure transducers were installed at the Nuiqsut Road crossing.

Challenges

None

Comments

Channels in the delta remain largely clear of ice floes; channel ice remains intact in the Nigliq Channel and East Channel.

The ice jam, 7 river miles upstream of MON1, is holding and increasing in size. Backwater flooding is evident upstream of the jam.

Both swale bridges are conveying flow, the Short Swale is unobstructed, while some snowpack remains in the eastern side of the Long Swale. Flow through the swale bridges is now hydraulically connected to the Sakoonang Channel through Lake M9933. Culverts adjacent to the swale bridges continue to convey flow.

Planned for Next Field Day
Facility and delta wide gage observations. Rehabilitate several gage sites on the downstream Nigliq Channel overbank. Prepare boats for discharge measurements.
Daily Photo(s)

Photo 1: Ice jam and backwater flooding located 7 river miles upstream of MON1, looking south; June 2, 2013

Photo 2: Discharge measurements on the Large Swale bridge; June 2, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup			**Date**	June 3, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Garrett Yager				
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)				
Subcontractor	Bristow				
Morning Check-In	8:00 AM	**Contact Person**	Helicopter Coordinator		
Evening Check-In	12:17 AM 06/04/2013	**Contact Person**	Jodi Smith		

Wind	**Temperature**	**Sky**
15-20 mph	27°F	Cloudy/fog

Health & Safety

Field personnel held a daily safety meeting.

Summary of Events

Freezing conditions grounded the helicopter all day. Personnel used the downtime to enter data collected in previous days. Boats were prepared for discharge measurements, diagnostics were run on the Acoustic Doppler Current Profiler (ADCP), and two local gage runs were completed.

By evening, stage at the Large and Small Swale bridges was high enough to justify additional observations. Stage continued to increase throughout the night. Grounded ice downstream of the Large Swale bridge is resulting in local backwater conditions at the bridge. Crews notified CPAI management, Roads and Pads team lead, and CD2 Drill Site Operator that water levels were approaching the 10-year flood mark at gage G3 on the south side of the swale bridges.

Challenges

None

Comments

Water levels have increased near facilities. Lake M9525 is recharging from Sakoonang Channel overflow to the east. Water from Lake L9324 is beginning to flow through the south CD4 culvert battery into Lake L9323 and continuing through the north CD4 culvert battery into Lake M9525.

Planned for Next Field Day

Facility and delta wide gage observations.
Discharge measurements from the swale bridges if conditions are favorable.

Daily Photo(s)

Photo 1: Grounded ice downstream of the Large Swale bridge, looking north; June 3, 2013

Photo 2: North CD4 culvert battery conveying flow from Lake L9324 to Lake L9323, looking north; June 3, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup	**Date**	June 4, 2013
Project Number	135141	**Document No.**	N/A
Submitted by	Karen Brown		
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)		
Subcontractor	Bristow		
Morning Check-In	6:30 AM	**Contact Person**	Helicopter Coordinator
Evening Check-In	10:00 PM	**Contact Person**	Helicopter Coordinator

Wind	**Temperature**	**Sky**
10 mph	27° F	Cloudy

Health & Safety

Field personnel held a daily safety meeting, and attended a helicopter toolbox meeting prior to departure. All personnel geared up in the site specific personal protective equipment prior to beginning field activities.

Summary of Events

An early over flight of the delta was delayed due to weather. One crew departed Alpine around noon to monitor breakup on the Colville River Delta. The second crew monitored gages around roads and pads throughout the day.

Challenges

None

Comments

Breakup is in full swing, and we should be at or near peak within the next two days. The stage at Umiat appears to be leveling off, and the water levels within the Delta are likely to start to dropping as the ice moves out. There is flooding in areas that we do not see every year, so it appears to be higher than average. There also seems to be a lot of ice jamming affects this year.

Upstream of Nuiqsut, where the Colville River is confined to a single channel, the highest water levels were recorded at about noon today. This may have been the peak elevation.

The ice jam upstream of Monument 1 released and has moved to the Tamayayak bifurcation on the East Channel. By 5 p.m., water levels at Monument 1 had decreased about 1-foot. The channel ice has cleared.

An ice jam approximately 1 mile upstream of CD4 along the Nigliq Channel caused overbank flow and backwater to build south of the CD4 pad. The ice jam in the East Channel also pushed water into the CD4 area. The culverts and gravel facilities are functioning as designed.

The highest water levels in the CD4 area were seen at about 2 p.m. and are now dropping slightly. Water levels at CD1 and CD2 started rising yesterday.

It appears the peak water levels have been reached in the southern part of the delta and are peaking near the coast.

Water levels at Umiat are still high. Another wave or high flow could come through but as the ice moves out flooding should be less prevalent.

Planned for Next Field Day

Personnel will monitor water elevations along the pads and roads and swale bridges throughout the day and evening. Discharge measurements will be collected at the swale bridges and culverts on the CD2 road. Discharge measurements at the CD4 culverts will be performed when it is safe to do so. Over flights of the Colville River Delta will be performed and gages will be monitored as weather allows.

Daily Photo(s)

Photo 1: CD2 pad looking north; June 4, 2013

Photo 2: Nigliq channel ice jam upstream of CD4; June 4, 2013

Photo 3: CD4 road and Lake M9525 looking northeast; June 4, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup			**Date**	June 5, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Karen Brown				
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, Bill Brooks, and Aaron Wells (ABR)				
Coordination	Bristow Helicopters, Ray; ABR, Aaron Wells				
Morning Check-In	7:30 AM	**Contact Person**	Helicopter Coordinator		
Evening Check-In	7:30 PM	**Contact Person**	Helicopter Coordinator		

Wind	**Temperature**	**Sky**
12 mph	28° F	Fog, Snow

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure. All personnel geared up in the site specific personal protective equipment prior to beginning field activities. Several Baker personnel attended helicopter sling load training in preparation for slinging boats to MON1 for discharge measurements.

Summary of Events

Over flights of the Colville River Delta and gage readings at monitoring locations were cancelled because of weather. One crew monitored gages throughout the day around the roads and pads. The second crew conducted discharge measurements at the long and small swale bridges. An update on flooding conditions was provided for CPAI's use in a presentation to the Village of Nuiqsut. As requested and permitted by CPAI, an update was provided to NOAA National Weather Service on conditions in the delta.

Challenges

Ice and submerged inlets and outlets prevented collecting discharge measurements at culverts along the CD4 and CD2 roads.

Comments

- Water levels continue to decrease slowly along the CD4 road. Water is equalizing between the upstream and downstream sides of the roads. All culverts appear to be functioning properly.
- Water levels continue to decrease slowly along the CD2 road. All culverts appear to be functioning properly.
- Water levels at Umiat appear to have crested just after midnight on June 5th and continue to drop.

Planned for Next Field Day

Personnel will monitor water elevations along the pads, roads and swale bridges throughout the day and evening. Discharge measurements at the CD2 and CD4 culverts will be performed when it is safe to do so. Over flights of the Colville River Delta will be performed and gages will be monitored as weather allows. Over flights of Fish Creek Basin will be performed and gages will be monitored as time and

weather allows.

Daily Photo(s)

Photo 1: South CD4 culvert battery outlets looking west; June 5, 2013

Photo 2: CD2 culverts between swale bridges, looking west; June 5, 2013

Photo 3: Measuring discharge along the long swale bridge, looking east; June 5, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup	**Date**	June 6, 2013
Project Number	135141	**Document No.**	N/A
Submitted by	Karen Brown		
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, and Bill Brooks		
Coordination	Bristow Helicopters, Ray; LCMF		
Morning Check-In	6:00 AM	**Contact Person**	Helicopter Coordinator
Evening Check-In	7:30 PM	**Contact Person**	Helicopter Coordinator

Wind	**Temperature**	**Sky**
10 mph	34° F	Light snow, then mostly sunny

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure. All personnel geared up in the site specific personal protective equipment prior to beginning field activities. Baker personnel were reminded by helicopter coordinator to not get complacent around the helicopter and to watch each other for signs of fatigue.

Summary of Events

One crew conducted over flight observations of the Colville River Delta and gage readings at monitoring locations. The same crew flew to Fish Creek Basin and monitored gages on the Ublutuoch River and small streams.
The second crew conducted discharge measurements at the CD2 and CD4 road culverts. A few culverts were covered by water and no measurements were taken. The same crew also monitored gages around the roads and pads.

Challenges

Ice and submerged inlets and outlets prevented collecting discharge measurements at culverts along the CD4 and CD2 roads.

Comments

Water levels continue to decrease along the CD2 and CD4 roads. Discharge measurements were collected at all culverts not covered by water.

The ice jam on the Nigliq Channel, adjacent to the CD5 alignment, moved north in the early afternoon and lodged onto the intact channel ice west of CD2 at the mouth of the Nigliagvik Channel.

At Umiat, the water levels have dropped significantly.

Planned for Next Field Day

Personnel will monitor water elevations along the pads, roads, and swale bridges. One crew will prepare boats and conduct discharge measurements on the Colville River adjacent to MON1. The other crew will conduct observations of the Colville River Delta and monitor primary gages on the river. As

time allows, additional gages will be monitored in Fish Creek Basin.

Daily Photo(s)

Photo1: Grounded ice at MON1-D, looking east; June 6, 2013

Photo 2: The Nigliq Channel ice jam adjacent to CD2, looking south; June 6, 2013

Photo 3: Flooding on the Ublutuoch River, looking west; June 6, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup			**Date**	June 7, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Karen Brown				
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, and Bill Brooks				
Coordination	Bristow Helicopters, Ray; LCMF				
Morning Check-In	6:00 AM	**Contact Person**	Helicopter Coordinator		
Evening Check-In	7:30 PM	**Contact Person**	Helicopter Coordinator		

Wind	**Temperature**	**Sky**
10-15 mph	28° F	Fog, then mostly sunny

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure. All personnel geared up in the site specific personal protective equipment prior to beginning field activities. In preparation for discharge measurement near MON1, LCMF joined Baker crew for a safety meeting specific to discharge activities.

Summary of Events

Fog prevented crews from leaving the pad until afternoon. Once the fog cleared, one crew conducted gage readings and surveys at some CRD monitoring locations. The second crew conducted gage readings and surveys accessible from the Alpine roads and pads.

Boats were prepared for slinging and were moved to MON1 discharge location.

Challenges

A late start and inability to sling boats because of weather prevented crews from collecting discharge measurements adjacent to MON1 on the Colville River. Instead, crews collected water surface elevations and conducted surveys at some of the gages as time allowed. Slinging the boats was postponed to the late afternoon/early evening when weather had cleared sufficiently for safe operations.

Nearly all gages along the Nigliq Channel have been destroyed by ice, requiring additional survey efforts to record water surface elevations.

Comments

Water levels continue to decrease along the CD2 and CD4 roads and around the pads. Many culverts are now dry.

The ice jam on the Nigliq Channel remained in place at the confluence of the Nigliavik Channel, just south of CD2. The jam does not appear to be holding backwater.

Planned for Next Field Day
Once crew will conduct a final monitoring event at gages along the roads and pads at Alpine and at the Fish Creek Basin gages. The second crew will conduct discharge measurements on the Colville River adjacent to MON1.
Daily Photo(s)

Photo 1: Grounded ice on Nigliq Channel at the proposed CD5 crossing; June 7, 2013

Photo 2: Gage C at MON20 between grounded ice floes; June 7, 2013

Photo 3: Proposed CD5 Nigliq crossing, looking south; June 7, 2013

Photo 4: Sling load departing for MON1 discharge measurement; June 7, 2013

Daily Field Report

Project Name	Colville River Delta Spring Breakup			**Date**	June 8, 2013
Project Number	135141	**Document No.**	N/A		
Submitted by	Karen Brown				
Field Personnel	Steven Clark, Garrett Yager, Karen Brown, Sarah Case, and Bill Brooks				
Coordination	Bristow Helicopters, Ray; LCMF, A J Griffin				
Morning Check-In	6:00 AM	**Contact Person**	Helicopter Coordinator		
Evening Check-In	8:00 PM	**Contact Person**	Helicopter Coordinator		

Wind	**Temperature**	**Sky**
10 mph	34° F	Fog, then mostly sunny

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure. A boat specific meeting was conducted with the boat crew to discuss discharge activities, emergency procedures and proper use of personal protective equipment (PPE). All personnel geared up in the site specific PPE prior to beginning field activities.

Summary of Events

Fog prevented crews from leaving the pad until 11 AM. Once the fog cleared, one crew mobilized to MON1 to collect discharge measurements. A second crew was mobilized to run the safety boat for the discharge crew. The third crew conducted gage readings at MON28 and at Fish Creek Basin on the S streams and at the Ublutuoch River monitoring locations. An over flight of Fiord West gages occurred, but shallow standing water prevented landing.

Boats were prepared for slinging and were moved back to CD2 pad via the helicopter.

Challenges

A late start prevented collection of water levels at all gages in Fish Creek Basin locations.

Comments

Discharge measurements were completed at MON1 on the Colville River.

No helicopter landings or gage readings will be conducted in the Colville River Delta after today. Crews will concentrate on gage readings and surveys in Fish Creek Basin.

Planned for Next Field Day

Two crew members will depart Alpine for Anchorage. The three crew members remaining at Alpine will continue to collect water levels and surveys in Fish Creek Basin. The helicopter will sling a boat to the Ublutuoch River to collect discharge measurements.

Daily Photo(s)

Photo 1: Ublutuoch River gage sites, looking east; June 8, 2013

Photo 2: Acoustic Doppler Current Profiler (ADCP) mounted on inflatable boat for discharge measurements at MON1; June 8, 2013

Daily Field Report

Project Name	Colville River Delta Breakup, Fish Creek Basin Breakup, and Cassin Lakes Recharge Studies	**Date**	June 9, 2013
Project Number	135141, 135006, 134783	**Document No.**	N/A
Submitted by	Karen Brown		
Field Personnel	Steven Clark, Garrett Yager, and Karen Brown		
Coordination	Bristow Helicopters, Ray		
Morning Check-In	6:00 AM	**Contact Person**	Helicopter Coordinator
Evening Check-In	8:00 PM	**Contact Person**	Helicopter Coordinator

Wind	**Temperature**	**Sky**
5 mph	35° F	Rain

Health & Safety

Field personnel held a daily safety meeting and attended a helicopter toolbox meeting prior to departure. Personnel discussed fatigue and implemented additional safety measures. All personnel geared up in the site specific personal protective equipment prior to beginning field activities.

Summary of Events

Two crew members demobilized to Anchorage. Weather prevented the remaining three person crew from leaving the pad until noon. The crew mobilized to Cassin to setup gages on lakes. Two survey control points were established at each lake. Level loop surveys were conducted and water levels were collected. Crews conducted an over flight and photo documented the Cassin ice road stream crossings. Next, the crew collected water levels and conducted surveys at the 6 Clover Mine Site gage sets.

Challenges

A late start prevented collection of water levels at all gages in Fish Creek Basin locations. Discharge measurements were not collected on the Ublutuoch River because of the late start. The additional time necessary to sling and retrieve the boat would have prevented completion of discharge measurements. Helicopter time was used to install the Cassin gages and collect data in Fish Creek Basin.

Comments

Lakes are still frozen in the Colville River Delta, Cassin, and Fish Creek Basin. Baseline photos were taken at all lakes. A crew will remobilize after the lakes have thawed to complete photo documentation and to collect water levels at the Cassin Lakes and other lake gage sites. No gage reading will occur within the restricted eider nesting area without prior coordination.

Planned for Next Field Day

Two crew members will set the final Cassin Lake gage then continue to collect water levels and conduct surveys at the Small Stream gage locations 4 and 5 and at Nuiqsut Road. Over flights of the Small Stream gages sites 1, 2, 3, 6 and 7 and Greater Moose's Tooth 1 and 2 will occur if time allows. One crew member and one LCMF personnel will document erosion on the CD2 and CD4 roads. The crew will not access the tundra at any time during the erosion study. In addition, gear will be cleaned and packed in anticipation of the final demobilization of the remaining three crew members on Tuesday.

Daily Photo(s)

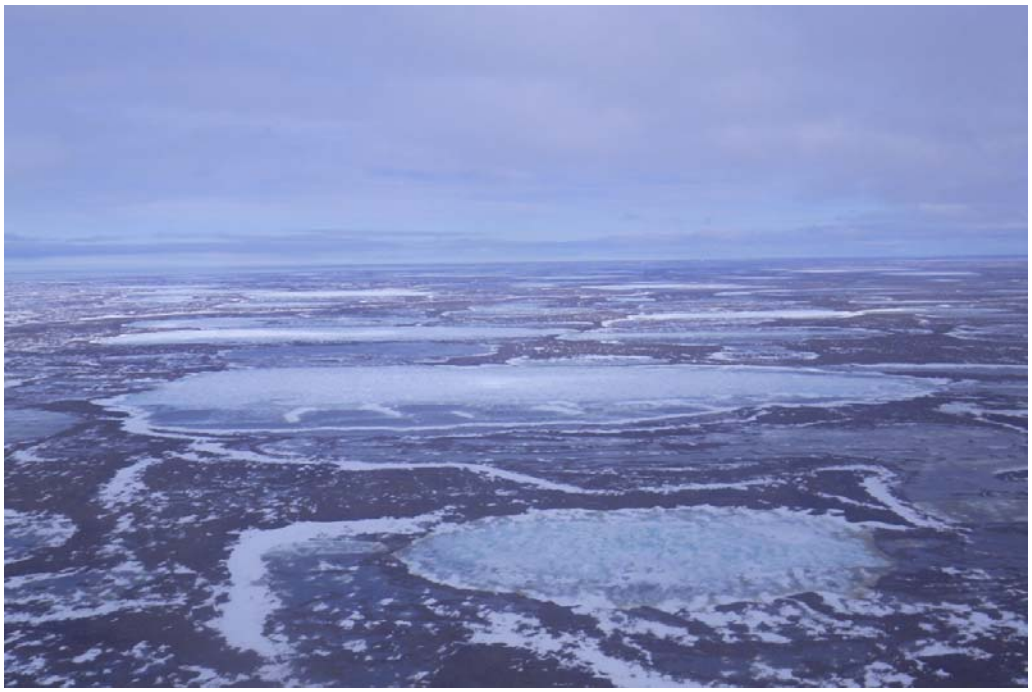

Photo 1: Lake R0076 looking east; June 9, 2013

4

Photo 2: Cassin ice road crossing at Fish Creek, looking upstream; June 9, 2013

Daily Field Report

Project Name	Colville River Delta Breakup, Fish Creek Basin Breakup, and Cassin Lakes Recharge Studies			**Date**	June 10, 2013
Project Number	135141, 134783, 135006	**Document No.**	N/A		
Submitted by	Karen Brown				
Field Personnel	Steven Clark, Garrett Yager, and Karen Brown				
Coordination	Bristow Helicopters, Ray Rush and Josh Toal ; LCMF, AJ Griffin				
Morning Check-In	6:00 AM	**Contact Person**	Helicopter Coordinator		
Evening Check-In	3:00 PM	**Contact Person**	Helicopter Coordinator		

Wind	**Temperature**	**Sky**
5 mph	35° F	Fog, mostly cloudy in afternoon

Health & Safety

Field personnel held a daily safety meeting to discuss helicopter and road activities prior to departure. A helicopter toolbox form was discussed and prepared. Personnel discussed fatigue and implemented additional safety measures. All personnel geared up in the site specific personal protective equipment prior to beginning field activities.

Summary of Events

Weather and additional helicopter users prevented the two person crew from leaving the pad until 11:00 AM. The crew mobilized to the Small Stream S gages in Fish Creek Basin. Because of limited helicopter time, over flights were performed and photographs were taken at all of the Small Stream sites. Gage readings were collected at 2 Small Stream sites. An over flight of Greater Moose's Tooth 2 was performed and photo documentation of the area was collected. One additional gage was setup and surveyed at Cassin Lakes. Three survey control points were established. A level loop survey was conducted and water levels were collected. The crew collected water levels at the Nuiqsut Road gages. One crew member and one LCMF personnel conducted erosion studies along the CD2 and CD4 roads, and profiled the channel bottom at the long and short swale bridges.
Crew members cleaned, inventoried and packed gear for storage and shipment.

Challenges

A late start and limited helicopter time (3 PM. end) prevented collection of water levels at all gages in Fish Creek Basin locations and Greater Moose's Tooth 1 and 2. Helicopter time was used to install the final Cassin gage and collect water levels at Nuiqsut Road and on the Small Streams at S4 and S5 in Fish Creek Basin.

Comments

Lakes are still frozen in the Colville River Delta, Cassin, and Fish Creek Basin. Baseline photos were taken at all lakes. A crew will remobilize after the lakes have thawed to complete photo documentation and to collect water levels at the Alpine and Cassin Lakes gage sites. No gage reading will occur within the

restricted eider nesting area without prior coordination. In addition, the field crew will complete surveys at all the Small Stream gages sites in Fish Creek Basin and Nuiqsut Road in Colville River Delta. They will collect water levels and high water mark, and retrieve pressure transducers at all Fish Creek Basin locations.

Planned for Next Field Day

Three crew members will demobilize to Anchorage.

Daily Photo(s)

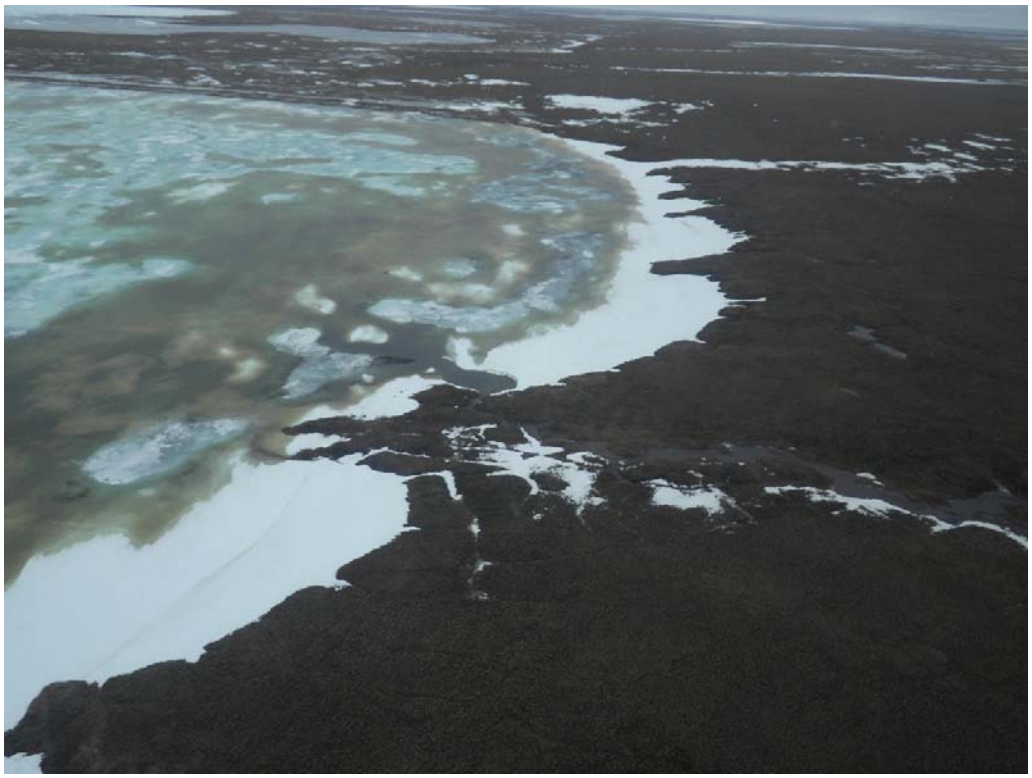

Photo 1: Inflow to lake L9805, looking east; June 10, 2013

Photo 2: A small eroded scarp in the CD2 road prism west of the small swale bridge, looking east; June 10, 2013

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